**Proposed Comprehensive Update to the State of Rhode Island's Congestion Management Process**

**Statewide Planning Program**

**January 2018**

## Summary Outline of of Action Steps

1. **Develop Objectives for Congestion Management**
   - What is the desired outcome?
     - What is considered unacceptable congestion?
   - What do we want to achieve?
     - Objectives should guide the decisions made throughout the CMP and MPO planning process
     - Define Congestion management principles, which shape how congestion is addressed from a policy perspective.
2. **Define CMP Network**
   - What components of the transportation system are the focus?
     - Geographic scope
     - System elements that will be analyzed in the CMP (e.g. freeways, major arterials, transit routes, freight facilities, bike/ped etc.)
     - Identification of FHWA Routes of Significance
3. **Develop Multimodal Performance Measures**
   - How do we define and measure congestion?
     - Develop performance measures to measure congestion – statewide and local scale
     - Performance measures should relate to, and support objectives
4. **Collect Data/Monitor System Performance**
   - Data should be collected and analyzed to determine – How does the system perform?
5. **Analyze Congestion Problems and Needs**
   - Using data and analysis techniques, the CMP should address – What congestion problems are present in the region, or are anticipated?
   - What are the sources of unacceptable congestion?
6. **Identify and Assess Strategies**
   - Working with partners, the CMP should address – What strategies are appropriate to mitigate congestion?
   - This involved both identifying and assessing potential strategies, and may include efforts conducted as part of the LRTP, corridor studies, or project studies.
7. **Program and Implement Strategies**
   - How and when will solutions be implemented?
     - Include strategies in the LRTP, determining funding sources, prioritization strategies, allocating funding in the TIP, and implementing these strategies.
8. **Evaluate Strategy Effectiveness**
   - Assess – What have we learned about implemented strategies?
   - This action may be tied closely to monitoring system performance under #4, and is designed to inform future decision making about the effectiveness of transportation strategies.

**Detailed Action Steps**

**Action 1 - Develop Objectives for Congestion Management**

I. What are the causes of congestion in RI? Identify percentages in Rhode Island or use national numbers below
   a. Bottlenecks 40% – points where the roadway narrows or regular traffic demands (typically at traffic signals) cause traffic to back up
   b. Traffic incidents 25% – crashes, disabled vehicles, debris on the road, etc.
   c. Work zones 10% – for new road building and maintenance activities
   d. Weather 15% – snow, rain, sun glare, etc.
   e. Poor signal timing 5% – the faulty operation of traffic signals or signals where the time allocation for a road does not match the volume on that road
   f. Special events 5% – causes "spikes" in traffic volumes and changes in traffic patterns

II. What is the desired outcome?
   a. What is considered unacceptable congestion?
   b. Eliminating traffic congestion may not be possible.
      - Identify of prioritization
   c. Looking at in the context of livability, economic vitality, safety, and multimodal access → leads to strategies that help to achieve the vision

III. What do we want to achieve?
   a. Objectives should guide the decisions made throughout the CMP and MPO planning process
   b. Define Congestion management principles, which shape how congestion is addressed from a policy perspective.
      - Should draw from vision and goals articulated in the LRTP or could be specific to CMP.
      - What does the public really care about with regard to congestion?
      - How high of a priority is traffic congestion in the state?
      - What type of congestion is most problematic for the public and freight shippers?
      - What aspects of congestion are most important to address to support livability, safety, and economic vitality, among other goals?
   c. Could lead to a focus on issues such as:
      - Improving transportation system reliability
      - Increasing multimodal options so that people have greater choices and the ability to avoid traffic congestion
      - Focusing attention on strategic freight corridors or economic development corridors
      - Creating greater accessibility through smart growth development patterns that reduce the need for vehicle travel
      - Providing improved traveler information so that the public can make informed travel decisions

IV. Characteristics of Congestions Management Objectives
    a. Focus on outcomes → where meaningful performance measures can be derived from the objectives
        - Hours of delay, system reliability, and access to traveler information.
        - Incident clearance time, number of traffic signals, retimed annually
    b. SMART
        - Specific – to guide the formation of viable approach without dictating the approach
        - Measureable – quantitative evaluation, tracking progress
        - Agreed – consensus on common objective
        - Realistic – can be accomplished
        - Time-bound – identifies a timeframe within which it is achieved
        - Examples –
            - Reduce hours of delay per capita by 15 percent by 2040
            - Reduce mean incident clearance time per incident by 20 percent over 8 years
        - Can start out more general (e.g. improve system reliability) but then the actions that follow – including defining performance measures, collecting data, etc. – should be made more specific , measureable, and timebound (e.g. reduce the person hours of total delay on highways and major arterials associated with traffic incidents by x percent over y years)
    c. A typical progression may occur as follows:
        - Identify important congestion concerns in the state
        - Select the area and time of focus, such as major arterials during peak hours
        - Identify what data are being collected or may be available to track the objectives. Based on this information, make the objectives more specific and define specific performance measures.
        - Consider growth trends, fiscal constraints, and other factors to ensure the objectives are realistic.

V. Congestion Management Principles
    a. Develop principles that shape how congestion is addressed from a policy perspective. They are different from objectives since they do not focus on outcomes or outputs that can be measured or tracked over time. Rather, they are statements of priority from a policy perspective. For example,
        - Affirm the importance of addressing all modes of transportation
        - Place priority or emphasis on certain types of congestion management strategies, such as demand management and operations, before accommodating vehicle travel demand.

**Action 2 - Define CMP Network**

I. Define the system components/network of surface transportation facilities
   a. Travel demand model is primary analysis tool and typically provides the baseline for establishing a CMP roadway network
      i. If model contains a transit network, consider how 2 modes interact

II. System Components
   a. Identification of FHWA Routes of Significance on which traffic information should be collected
      i. **Routes Of Significance** are non-Interstate roadways in metropolitan areas that are designated by States as meriting the collection and provision of information related to traffic and travel conditions. Factors to be considered in designating routes of significance include roadway safety (e.g., crash rate, routes affected by environmental events), public safety (e.g., routes used for evacuations), economic productivity, severity and frequency of congestion, and utility of the highway to serve as a diversion route for congestion locations. All public roadways including arterial highways, toll facilities and other facilities that apply end user pricing mechanisms shall be considered when designating routes of significance. In identifying these routes, States shall apply the collaborative practices and procedures that are used for compliance with 23 CFR part 940 and23 CFR part 420
   b. Often based on functional classification, traffic volumes
      i. See if we can do minor arterials and above
         1. Identify the percentage of all roadway mileage in the state
         2. Identify volume, VMT on these roads for the state
      ii. Typically collectors and local roadways are not included since it would be too time consuming to collect info and have low volumes
      iii. Often include major intersections along arterials where travel delay often occurs
   c. And then a subset of these roads are defined as CMP corridors for further steps in the process
   d. Multimodal transportation elements
      i. Transit service as it interacts with the highway network

**Action 3 – Develop Multimodal Performance Measures**

I. Overall
   a. Assess system performance in order to identify problem areas and communication this information to the public and decision makers.

II. Roles of Performance Measures
   a. Characterize current and future conditions on the transportation system
   b. Track progress toward meeting objectives
   c. Identify specific locations with congestion to address
   d. Assess congestion mitigation strategies, programs, and projects
   e. To communicate system performance
   f. Used at 2 levels
      i. Statewide level – to measure performance of the statewide transportation system
         1. To track progress towards the achievement of the objectives
      ii. Local (corridor, segment, intersection) level – to identify location with congestion problems and to measure the performance of individual segments or system elements
         1. Used to support assessment and selection of congestion mitigation strategies and evaluation of implemented strategies
         2. The smaller scale application of this often means the performance measures selected for monitoring system-level congestion and tracking regional objects must be tailored to be applicable at a segment, link, or intersection scale.
         3. A threshold or definition of unacceptable congestion may be developed for performance applied at the local level.
         4. Important for these measures of congestion be linked to statewide performance measures so that measures used to pinpoint congestion problems and evaluate solutions have a connection to the attainment of statewide objectives

III. Performance Measure May be adapted and Adjusted Over Time – 3 main Activities
   a. Select performance measures
   b. Develop a data collection plan
   c. Refine objectives and performance measures

IV. Selecting Performance Measures
   a. Components of Congestion
      i. Volume to capacity (V/C) or level of service (LOS)
      ii. As a concept
         1. Quality of use of the system and Quantity of use

2. Spatial and temporal – the where (location, ie intersections, roadway segments, or transit routes) and the when (time of day or year)
3. Systemic aspect –actions that take place in one part of the transportation system can affect (positively and negatively) congestion on other nearby facilities
4. Relative aspect- observations of congestion may be qualitatively perceived as being more or less severe than observed at the same location at a different time, or at a different location.

b. 4 major dimension of congestion include
   i. Intensity – the severity that affects travel. Often measured through V/C ratios or LOS
   ii. Duration – amount of time the congested conditions persist
   iii. Extent - Number of system users or components (e.g. vehicles, transit routes, lane miles) affected by congestion, for example the proportion of system network components (roads) that exceed a defined performance measure target.
   iv. Variability – the change in congestion that occur on different days or at different times of day. When congestion is highly variable due to non-recurring conditions, such a roadway with a number of traffic accidents causing delays, this has an impact on the reliability of the system

V. Different types of Performance Measures
   a. Volume to Capacity Based Measures
      i. Data is relatively easy to obtain
      ii. Travel demand models
   b. Travel time measures – focus on the time needed to travel along a selected portion of the transportation system. Common variations of metrics include:
      i. Average travel speed – the length of a segment divided by the travel time, or
      ii. Spot speed – the speed of a vehicle over a given time interval passing a point along a roadway
      iii. Delay – the difference between travel time and acceptable or free flow travel time
      iv. Travel time index – ratio of peak-period to non-peak period travel time
   c. Variability of Congestion / Reliability – the variability or change in congestion on a day-to-day basis provides a measure of reliability.
      i. Recurring vs. non-recurring congestion
   d. Measures addressing Transit System Congestion and/or Reliability p 19
      i. Passenger crowding or utilization
      ii. Reliability of performance or schedule adherence
      iii. High volume loading congestion
   e. Measures addressing multimodal (Transit, bicycle, pedestrian) Availability
   f. Freight Performance Measures
      i. Volume to capacity ratio or travel times but focus on roadways with high volume of trucks or designated freight corridors

g. Accessibility Measures
    i. Ability of the public to reach employment site, retail centers, activity centers, and other sites that produce or attract demand
h. Land Use Measure – looks at the interconnection between land use in a given area and how supportive it is of transit, bicycle, and pedestrian transportation

VI. Considerations in Selecting and Utilizing Performance Measures
a. Using multiple performance measures
b. Focus on persons and goods, rather than vehicles – focus on the experience of the individual
    i. Hours of delay, personal travel time,
c. Use Screening measures, with Additional Measures of Identified Congested Locations
    i. Develop a tiered structure for performance measures. Identified congested corridors more in-depth set of measures
d. Define Different Level of Performance that are Acceptable in Different Circumstances
    i. Identify different thresholds based on location, facility type, and/or timeframe
e. Consider Use in Communicating Information
    i. Keep in mind the role of performance measures in communications to the public and decision makers. So that they will be useful in decision making.

VII. Developing a Data Collection and Management Plan
a. Creating a plan or collecting the data needed to support the performance measures
b. What data is needed
c. Where data will be collected
d. How often will it be collected, and by whom,
e. Accuracy levels and data formats

VIII. Refining Objectives and Performance Measures
a. May need to reconsider the objective and/or performance measures – reality check

**Action 4 – Collect Data / Monitor Performance**

I. Common Types of Data and Collection Techniques
   a. Traffic Volume Counts (automated or manual)
      i. AADT
   b. Speed and Travel Time Data
      i. Vehicle Probe (VPP) – Inrix data
   c. Archived ITS and Operations Data
      i. ITS, VPP, loop detectors, cameras,
   d. Other electronic traffic data sets
      i. Cell phone data
   e. Aerial photo-based congestion data
   f. Transit data
      i. Buses equipped with automatic vehicle location (AVL) to help identify congestion on arterials
   g. Bicycle / Pedestrian data
      i. Count information
   h. Crash data
      i. Method for determining where non-recurring congestion is likely to occur due to incidents
   i. Travel survey data
      i. National Household Travel Survey (NHST), ACS

**Action 5 – Analyze Congestion Problems and Needs**

I. Overall
   a. Translate raw data into meaningful measures of performance
   b. Identify specific location with congestion problems,
   c. and to identify the sources of these problems

II. When Analyzing Data look to the Following:
   a. Locations of major trip generators
      i. Freight/intermodal facility, major tourist attractions, stadiums/arenas, universities, hospitals, major employers/centers, airports, and major shopping malls)
      ii. Typical traffic patterns, users, and times of high demand at these locations
   b. Seasonal traffic variations
      i. School related, tourist/resort activity, weather conditions, daylight conditions
      ii. When possible data should be collected at times that will account for these variations
   c. Time of day traffic variations
      i. Not all locations experience their highest demand during typical peak periods, especially in area with heavy school traffic
   d. Work trips vs non-work trips

III. Apply the definition of Unacceptable Congestion Considered in Action 2 to Individual Sections of the System. This may result in the following:
   a. A set of Corridors defined as "congested: based on the performance measures
      i. These corridors may be used to denote areas where activities to address congestion are necessary
   b. A Ranking of corridors in the state (often ranked separately in categories based on functional class) to determine which corridors rank the highest in terms of congestion relief needs
   c. An Analysis of how well the state as a whole is meeting established congestion management objectives

**Action 6 – Identify and Assess CMP Strategies**

I. Overall
   a. Utilize the data and analysis (of Actions 4 & 5) into a set of recommended solutions to effectively manage congestion and achieve congestion management objectives
   b. The identification of strategies requires several important considerations:

II. Contribution to Meeting State Congestion Management Objectives
   a. Strategies should support congestion management objectives identified in Action 1

III. Local Context
   a. Community and public involvement should play a role in determining strategies that are appropriate for specific corridor, facility, or intersections

IV. Contribution to other Goals and Objectives
   a. Consider strategies in the context of multiple goals and objectives for the area
      i. Safety, economic, system preservation, air quality, etc.

V. Jurisdiction over CMP Strategies
   a. MPO charged with implementing CMP will typically rely on other governmental partners (DOT, transit, municipal).
      i. Land use planning

VI. Identifying Congestion Management Strategies
   a. Demand Management Strategies – Travel Demand Management (TDM), nonautomotive travel modes, and land use management can all help to provide travelers with options and reduce number of vehicles or trips
      i. Promoting alternatives
         1. Transit, bike/ped improvements
      ii. Managing and pricing assets
         1. Congestion pricing, Parking management
      iii. Work patterns
         1. Flexible work hours, telecommuting
      iv. Land use
         1. Land use controls or zoning to support mixed use developments and TMD friendly neighborhoods
         2. Growth management – urban growth boundary
         3. Policies that support TOD
         4. Incentives for high density development
      v. Traffic Operations Strategies – focus on getting more out of what we have. Use of ITS
         1. Highway Operations
            a. Access management, HOV lanes, bus only lanes, movable median barriers
         2. Arterial and Local Roads Operations
            a. Optimizing timing of traffic signals, restricting turns at key intersections, geometric improvements, access management, traffic calming, road diets

3. Other operations strategies
    a. Faster and anticipatory responses to traffic incidents (incident management), traveler information systems, improved management of work zones, identifying weather and road surface problems and rapidly targeting responses, better freight management

vi. Public transportation Strategies –
    1. improving transit operations
    2. capacity strategies
    3. accessibility strategies

vii. Road Capacity Strategies – adding more capacity to the road network

VII. Accessing Congestion Management Strategies

a. Travel Demand Model
b. Sketch planning tolls
    i. EPA's COMMUTER model
c. Past experience or evaluations of strategies
d. Analytical / Deterministic tools
    i. Highway capacity Manual
e. Traffic signal optimization tools
    i. Optimal Signal phasing and timing plans
f. Simulation models
g. Dynamic traffic Assignment (DTA)

**Action 7 – Program and Implement CMP Strategies**

I. Overall - Implementation of CMP strategies occurs on 3 levels
   a. System
   b. Corridor
   c. Project

II. System Prioritization of Strategies
   a. Use of CMP in criteria for prioritizing projects in the TIP
      i. Scoring element of projects
      ii. Use of data to make decisions
   b. Explicitly set aside funding for congestion management projects

III. Corridor and Project Studies
   a. Consistency between planned/programmed projects and the CMP should be ensured
   b. Collaboration with partners is critical in this step

**Action 8 – Evaluate Strategy Effectiveness**

I. Overall –
   a. Evaluation of strategy effectiveness can be seen as either a sequential step within the CMP or as an on-going process. This is an essential, element that is often overlooked.
   b. Primary goal – To ensure that implemented strategies are effective at addressing congestion as intended, and to make changes based on the findings as necessary

II. System level Performance Evaluation
   a. State analysis of historic trends to identify improvement or degradation in system performance, in relation to objectives, and

III. Strategy effectiveness Evaluation
   a. Project level or program level analysis of conditions before and after the implementation of a congestion mitigation effort